

CLAIMS

What is claimed is:

1. An electronic circuit for ion sensor, comprising:

5 a bridge sensing circuit comprising an input terminal and a sensing output terminal, for sensing ion concentration of a solution, wherein the bridge sensing circuit comprises an ion sensing element, which has a reference electrode coupled to a ground, and one terminal of which coupled to the sensing output terminal for delivering the signal of ion concentration; and

10 a differential amplifying circuit, where a reference voltage is inputted into one input terminal of the differential amplifying circuit, while the other input terminal is coupled to the sensing output terminal of the bridge sensing circuit for delivering a differential voltage to the input terminal of the bridge sensing circuit such that the ion sensing element senses the ion concentration under the conditions of constant current and constant voltage.

- 15 2. The electronic circuit for ion sensor of claim 1, wherein the bridge sensing circuit further comprises:

a first amplifier;

a first impedance element, coupled between the input terminal of the bridge sensing circuit and the positive terminal of the first amplifier;

20 a second impedance element, coupled between the positive terminal and the output terminal of the first amplifier;

a third impedance element, coupled to the input terminal of the bridge sensing circuit and the negative terminal of the first amplifier thereby determining the constant current;

wherein the first amplifier, the first impedance element, the second impedance element, the third impedance element, and the ion sensing element constitute a bridge network such that the ion sensing element operates under the conditions of constant drain-source voltage and constant drain current.

- 5 3. The electronic circuit for ion sensor of claim 1, wherein the ion sensing element is an ISFET, whose drain terminal is coupled to the negative terminal of the first amplifier, the source terminal is coupled to the output terminal of the first amplifier, and the reference electrode is coupled to a ground.
- 10 4. The electronic circuit for ion sensor of claim 2, wherein the ion sensing element is an ISFET, whose drain terminal is coupled to the negative terminal of the first amplifier, the source terminal is coupled to the output terminal of the first amplifier, and the reference electrode is coupled to a ground.
- 15 5. The electronic circuit for ion sensor of claim 2, wherein a first capacitor is further coupled between the positive terminal of the first amplifier and the ground terminal.
6. The electronic circuit for ion sensor of claim 2, wherein a second capacitor is further coupled between the negative terminal and the output terminal of the first amplifier.
7. The electronic circuit for ion sensor of claim 1, wherein the differential amplifying circuit further comprises:

20 a second amplifier, whose output terminal is coupled to the input terminal of the bridge sensing circuit;

 a fourth impedance element, which is coupled between the negative terminal of the second amplifier and the reference voltage;

 a fifth impedance element, which is coupled between the sensing output terminal of the bridge sensing circuit and the positive terminal of the second amplifier;

a sixth impedance element, which is coupled between the positive terminal of the second amplifier and a ground; and

a seventh impedance element, which is coupled between the output terminal and the negative terminal of the second amplifier.

5 8. An electronic circuit for ion sensor, comprising:

10 a bridge sensing circuit which has an input terminal and a sensing output terminal, for sensing ion concentration of a solution, wherein the bridge sensing circuit comprises an ion sensing element, which has a reference electrode coupled to a ground, and one terminal of which coupled to the sensing output terminal for delivering the ion concentration;

 a voltage generating circuit for generating a constant voltage according to a negative voltage source;

 a follower type impedance converter circuit for amplifying the constant voltage as a reference voltage;

15 a differential amplifying circuit, the reference voltage being inputted into one input terminal of which circuit, the other input terminal being coupled to the sensing output terminal of the bridge sensing circuit for delivering a differential voltage to the input terminal of the bridge sensing circuit such that the ion sensing element senses the ion concentration under the conditions of constant drain current and constant drain-source
20 voltage.

9. The electronic circuit for ion sensor of claim 8, wherein the bridge sensing circuit further comprises:

 a first amplifier;

 a first impedance element, coupled between the input terminal of the bridge sensing

circuit and the positive terminal of the first terminal;

a second impedance element, coupled between the positive terminal and the output terminal of the first amplifier;

5 a third impedance element, coupled to the input terminal of the bridge sensing circuit and the negative terminal of the first amplifier thereby determining the constant current;

10 wherein the first amplifier, the first impedance element, the second impedance element, the third impedance element, and the ion sensing element constitute a bridge network such that the ion sensing element operates under the conditions of constant voltage and constant current.

10. The electronic circuit for ion sensor of claim 8, wherein the ion sensing element is an ion-sensitive field effect transistor, whose drain terminal is coupled to the negative terminal of the first amplifier, the source terminal is coupled to the output terminal of the first amplifier, and the reference electrode is coupled to a ground.
- 15 11. The electronic circuit for ion sensor of claim 9, wherein the ion sensing element is a ion-sensitive field effect transistor, whose drain terminal is coupled to the negative terminal of the first amplifier, the source terminal is coupled to the output terminal of the first amplifier, and the reference electrode is coupled to a ground.
- 20 12. The electronic circuit for ion sensor of claim 9, wherein a first capacitor is further coupled between the positive terminal of the first amplifier and the ground terminal.
13. The electronic circuit for ion sensor of claim 9, wherein a second capacitor is further coupled between the negative terminal and the output terminal of the first amplifier.
14. The electronic circuit for ion sensor of claim 8, wherein the differential amplifying circuit further comprises:

a second amplifier, whose output terminal is coupled to the input terminal of the bridge sensing circuit;

a fourth impedance element, which is coupled between the negative terminal of the second amplifier and the reference voltage terminal;

5 a fifth impedance element, which is coupled between the sensing output terminal of the bridge sensing circuit and the positive terminal of the second amplifier;

a sixth impedance element, which is coupled between the positive terminal of the second amplifier and a ground; and

10 a seventh impedance element, which is coupled between the output terminal and the negative terminal of the second amplifier.

15. The electronic circuit for ion sensor of claim 8, wherein the follower type impedance converter circuit further comprises a third amplifier.

15 16. The electronic circuit for ion sensor of claim 8, wherein the voltage generating circuit comprises a Zener diode, whose N electrode is coupled to the ground, and P electrode is coupled to the negative voltage source.

17. The electronic circuit for ion sensor of claim 8, wherein a eighth impedance element is further coupled between the positive terminal of the third amplifier and the N electrode of the Zener diode.

20 18. The electronic circuit for ion sensor of claim 8, wherein a ninth impedance element is further coupled between the positive terminal of the third amplifier and the P electrode of the Zener diode.

19. The electronic circuit for ion sensor of claim 8, wherein a tenth impedance is further coupled between the P electrode of the Zener diode and the negative voltage source.

- 5 20. The electronic circuit for ion sensor of claim 8, wherein the bandgap reference voltage generating circuit further comprises a first bipolar junction transistor, a second bipolar junction transistor, a fourth amplifier and the thirteen impedance element, the base terminals of the transistors are coupled with each other and to a ground, the collector terminals are coupled to the ground, the emitter terminal of the first bipolar junction transistor is coupled to the positive terminal of the fourth amplifier, the emitter terminal of the second bipolar junction transistor is coupled to the terminal of the thirteen impedance element and to the negative terminal of the fourth amplifier.
- 10 21. The electronic circuit for ion sensor of claim 20, wherein an eleventh impedance element is further coupled between the positive terminal and the output terminal of the fourth amplifier.
22. The electronic circuit for ion sensor of claim 20, wherein a twelfth impedance element is further coupled between the negative terminal and the output terminal of the fourth amplifier.

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